

Appendix A

Change the Equation Data

VITALSIGNS

ARKANSAS



Business leaders in Arkansas have sounded an alarm. They cannot find the science, technology, engineering and mathematics (STEM) talent they need to stay competitive. Students' lagging performance in K–12 is a critical reason why.

To address this challenge, Arkansas is raising the bar. The state has joined 44 others in adopting rigorous math standards for K–12—the Common Core State Standards—and it is working with other states to create robust tests aligned to those standards. These are promising developments, but to succeed amid profound practical, political and financial challenges, the state has to maintain its resolve.

Arkansas must ensure that schools and students have opportunities to meet a higher bar. The good news is that students have made real progress in math over the past decade. Yet not enough students, least of all minorities, are getting exposed to challenging content to prepare them for college and careers. Remediation for students who enter college with inadequate math skills costs the state millions.

The stakes in the state are very high. While the number of college degrees and certificates in the state rose almost 30 percent in the last decade, in STEM it fell by 20 percent. Among women, it fell a whopping 38 percent. In Arkansas, exciting all students about STEM is as important as raising their performance. Business leaders stand ready to work with educators and states to widen the pipeline.

STEM SKILLS ARE IN DEMAND

In Arkansas, STEM skills have stayed in demand even through the economic downturn.

STEM:
2.4 jobs for every
1 unemployed person



Non-STEM:
4.4 unemployed
people for every **1 job**



CAN ARKANSAS MEET THE DEMAND FOR STEM SKILLS?

Students have made real academic strides in most states, but no state is on track to getting all students the STEM skills they need to succeed in college and careers. Low-income and minority students lag farthest behind.

Students have improved in math

Since 2003, eighth graders in Arkansas have made gains on the National Assessment of Educational Progress (NAEP), also known as “the nation’s report card.” Yet most still have far to go to reach a score of 299, NAEP’s cutoff for “Proficient” performance.

8th Grade NAEP scale scores, 2003 & 2011

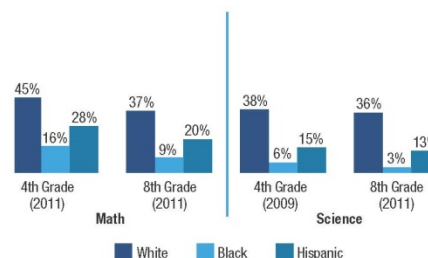
	NAEP Scale Score		Change Since 2003	
	2003	2011	AR	Most Improved State
All	266	279	+13	+17 (DC)
Low Income	256	269	+13	+19 (MA)
White	275	287	+12	+17 (HI)
Black	239	257	+17	+19 (NJ)
Hispanic	248	272	+24	+24 (AR)

Totals may not sum due to rounding errors.

Closing achievement gaps must remain a priority

No state has closed the persistent achievement gaps among racial and ethnic groups.

Percentage of students in Arkansas scoring at or above proficient in math and science, 2009 & 2011



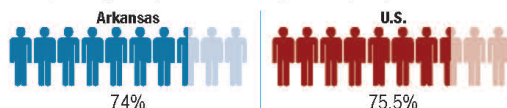
IN PARTNERSHIP WITH
the American Institutes for Research.

For the complete state report, methodology, and sources, visit changetheequation.org/stem-vital-signs.

VITALSIGNS

Arkansas must plug gaps in the STEM pipeline from high school through college

What percentage of high school students graduate? (2009)



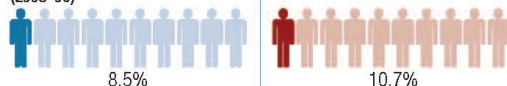
Of students who enter a two-year degree program, what percentage graduate? (2009)



Of students who enter a four-year degree program, what percentage graduate? (2009)



What percentage of college degrees and certificates are in STEM fields? (2008-09)



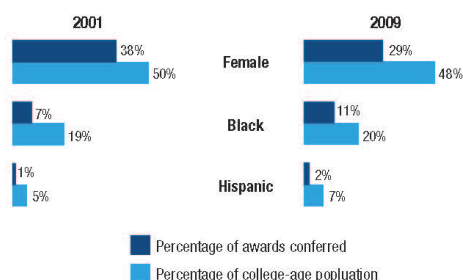
No student should need remediation

63% of Arkansas' first-time community college students need remediation in math, which costs the state **\$13,085,167** each year.

Women and minorities are too critical a resource to remain untapped

Women and minorities are a very large share of the population but they earn just a small share of STEM degrees and certificates.

Percentage of degrees/certificates conferred in STEM fields in Arkansas



WILL ARKANSAS STAND FIRM ON HIGH EXPECTATIONS?

Setting high expectations is a critical step toward raising student performance in STEM.

Arkansas is showing a commitment to high expectations

Arkansas has joined **44 other states in adopting Common Core State Standards** in math. Arkansas is also working with other states on common math tests to gauge students' mastery of those standards.

Common standards and tests in math could be a game changer

Arkansas used to set a low bar for students in math, but common standards and tests may change that. In 2009, Arkansas's bar for proficiency on its 4th and 8th grade math tests was near where the National Assessment of Educational Progress (NAEP) set the bar for merely "Basic" performance.

As **states adopt common tests aligned to the Common Core**, they will also have to **set a common high passing score** or threaten the credibility of the entire common standards enterprise. As the bar goes up, the rate of Arkansas students passing the tests may plummet. Arkansas **leaders will have to stand strong** on high expectations, even in the face of pressure to back down.

Of course, even the best standards and tests may fall flat if Arkansas does not ensure they are well implemented with supports like strong curriculum, teaching materials and professional development. The state should offer clear and regular public updates on its implementation efforts.

Science is the next frontier for better standards and higher expectations

Twenty-six states, including Arkansas, are collaborating on common **"Next Generation" content standards in science**, which they aim to complete in 2013. If these standards meet a high bar, Arkansas should adopt them or standards as rigorous.

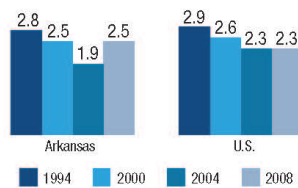
ARE STUDENTS EXPOSED TO CHALLENGING AND ENGAGING CONTENT?

Lack of access to such content severely limits young people's college and career prospects.

Building a strong foundation in science takes time

Time for science in Arkansas elementary schools has generally held steady since 1994.

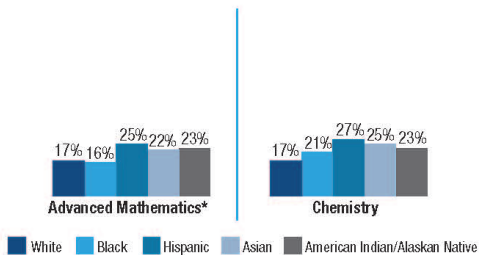
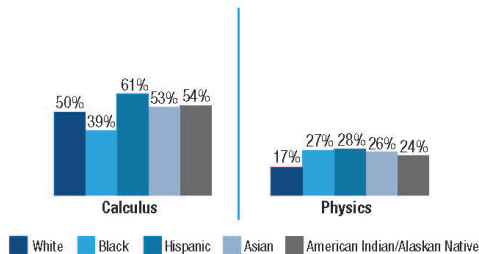
Hours per week spent on science in grades 1–4, 1994–2008



Students of all backgrounds need access to challenging math and science courses

Nationwide, many minority students lack access to such courses.

Percentage of students in schools that do not offer challenging math and science courses, by race/ethnicity, 2009



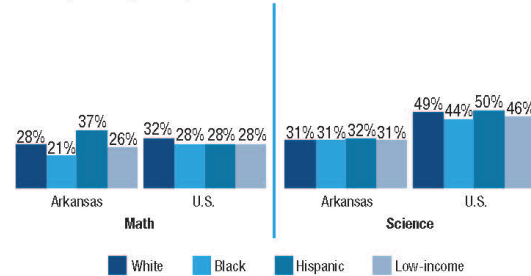
* Includes trigonometry, elementary analysis, analytic geometry, statistics, and precalculus

ARE TEACHERS PREPARED TO TEACH TO HIGH STANDARDS?

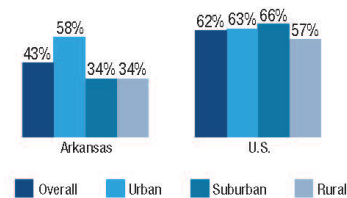
Research shows that teachers' content knowledge and teaching experience can affect student performance.

Teachers need deep content knowledge

8th graders whose teachers have an undergraduate major in the subject they teach, 2011



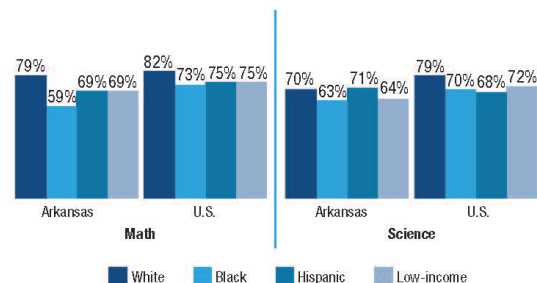
8th graders whose science teachers took three or more advanced science courses in college, 2011



High-need schools need to retain excellent teachers

In most states, minority and low-income students are more likely to have inexperienced teachers, indicating high turnover rates.

8th graders whose teachers have 5+ years of experience teaching their subject, 2011



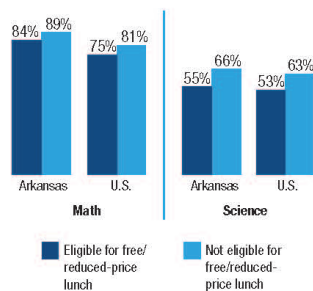
* Reporting standards not met.

For the complete state report, methodology, and sources, visit changetheequation.org/stem-vital-signs.

DO SCHOOLS AND TEACHERS IN ARKANSAS HAVE WHAT THEY NEED TO SUCCEED?

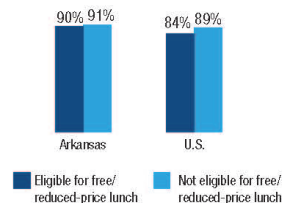
Teachers need the tools of their trade

8th graders whose teachers say they have all or most of the resources they need, by income, 2011



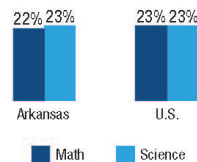
All students need access to science facilities and supplies

8th graders whose schools have science labs, by income, 2011



Parent support and engagement are critical to student success

Teachers who say lack of support is a serious problem, 2011



For the complete state report, methodology, and sources, visit changetheequation.org/stem-vital-signs.

RECOMMENDATIONS

Impatience is a virtue when it takes data and real solutions as its guides. The time to act is now. These Vital Signs provide business, education, state and policy leaders with an extensive and reliable set of indicators to promote STEM learning and high expectations for all students. We've crunched the numbers to offer insights into much-needed actions that can be undertaken right away with resolve.

■ Ease the transition between high school and college

Arkansas students should understand the requirements for college admission and whether a high school diploma prepares them for college-level work. One way to ensure that diplomas have meaning is to align state high school graduation and college entrance requirements. Arkansas also should expand access to rigorous courses in math and science. For example, the state could strengthen initiatives that help schools boost participation in AP courses, especially among women and minorities.

■ Stretch the STEM education investment

In lean or flush times, Arkansas must improve its return on investment in K-12 STEM education. Every dollar spent should be linked to student mastery of high expectations in STEM courses. This does not mean that resources are not critical to dramatically raising student performance. It does mean that Arkansas has to ask tough questions and make choices about which investments in STEM learning are most closely tied to the goals of college and career readiness.

■ Improve teacher preparation and support

Arkansas needs more teachers with a strong background in STEM content and pedagogy, particularly in math. Strategies include requiring teachers to demonstrate a stronger grasp of content while broadening the supply of teachers who can clear the higher hurdles. Arkansas should create more pathways into teaching for STEM majors in college or STEM professionals who are interested in teaching. The state should also strengthen incentives to attract and retain such teachers for the schools that need them most—often in low-income communities.

Current teachers must receive excellent professional development, especially as new math and science standards take effect. Rather than reporting on the amount of professional development teachers receive, states should measure and report on its quality.



Improving teaching and learning in science, technology, engineering and mathematics (STEM)
CHANGE THE EQUATION ■ 1101 K Street NW ■ Suite 610 ■ Washington DC 20005 ■ www.changetheequation.org